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VIT

Vellore Institute of Technology  
(Deemed to be University under section 3 of UGC Act, 1956)

23BC E0453

SCHOOL OF ADVANCED SCIENCES

Winter Semester 2023-2024

Continuous Assessment Test -II

Programme Name & Branch : B.Tech

Slot: (A1+TA1+TAA1- Common)

Course Name & Code: Differential Equations and Transformations (BMAT102L)

Exam Duration: 90 Min.

Maximum Marks: 50

General instruction(s): Answer ALL Questions

Q.No.	Question	Max Marks
1. ✓	Find the Laplace transform of the periodic function $f(t) = \begin{cases} t^2 & 0 < t < 2 \\ 2 & 2 < t < 3 \end{cases}$ with period $T = 3$ .	10
2. ✓	Find the inverse Laplace transform of $F(s) = \frac{1-s(5+3s)}{s[(s+1)^2+1]}$	10
3. ✓	For the LRC circuit given by $L \frac{d^2q}{dt^2} + R \frac{dq}{dt} + \frac{1}{c}q = E(t)$ where $\frac{dq}{dt}(0) = q(0) = 0$ and $L = 1, R = 3, C = 0.5, E = 10\delta(t)$ . Find: (a) the charge $q(t)$ and (b) the resulting current $i(t)$ in the circuit, using Laplace transforms with convolution theorem.	10
4. ✓	Find the Fourier series of the function $f(x) = \begin{cases} -x - \pi, & \text{for } -\pi < x < 0 \\ x + \pi, & \text{for } 0 < x < \pi \end{cases}$ , $\pi/c$ . hence find the sum $1 - \frac{1}{3} + \frac{1}{5} - \dots$	10
5. ✓	Find the half range Fourier cosine series of $f(x) = x(2-x)$ in $0 \leq x \leq 3$ , and hence find the sum $\frac{1}{1^2} - \frac{3}{2^2} + \frac{1}{3^2} - \frac{3}{4^2} + \dots$ D	10